3.3 TRAFFIC AND CIRCULATION

A. Methodology

This section is based on a transportation analysis conducted by Fehr & Peers Associates in October 2001. The technical calculations are included in Appendix B, under separate cover.

The analysis of potential traffic and circulation impacts was conducted based on the standards and guidelines of the City of Mountain View, the City of Sunnyvale, and the Santa Clara Valley Transportation Authority (VTA), which is the congestion management agency for Santa Clara County. The transportation analysis addresses all travel modes including automobile, transit, bicycle, and pedestrian facilities and services. Intersection operations were analyzed using level of service (LOS) based on peak hour traffic volumes, lane configurations, and traffic control devices, while the remaining modes were assessed based on more qualitative measures. Descriptions of the existing transportation system serving each portion of the project site and the surrounding study area is presented below.

B. Regulatory Setting

The proposed project is expected to impact facilities maintained, monitored, or under the jurisdiction of the Santa Clara Valley Transportation Authority, the Cities of Mountain View and Sunnyvale, Santa Clara County, the California Department of Transportation (Caltrans), and NASA. The regulatory issues associated with each of these agencies is presented below.

1. Local Rules and Regulations

This section describes relevant regulations in Santa Clara County and the Cities of Mountain View and Sunnyvale.

a. Congestion Management Program (CMP)

The Santa Clara Valley Transportation Authority (VTA) is the congestion management agency (CMA) for Santa Clara County and implements the CMP. The CMP monitors operations of all freeways and selected expressways and

regional arterials through a biennial count program and determines the need for deficiency plans to reduce overall congestion. The Congestion Management Program (CMP) facilities in the study area include Highway 101, State Route (SR) 237, SR 85, and Central Expressway.

The VTA has also established uniform methods and guidelines for evaluating the transportation impacts of land use decisions on CMP facilities. All of the cities and towns within Santa Clara County have adopted the same transportation impact analysis methodology and significance criteria except for selected areas that are governed by special policies (e.g., North San Jose, the Evergreen area in San Jose). This common set of methods and guidelines allows each CMP member agency to understand the impacts of development in adjacent jurisdictions. By projecting against significant impacts to CMP facilities, the VTA can better anticipate the effect of land use changes and improve the planning process for the overall regional transportation system. Impacts to CMP facilities must be addressed as part of the environmental review process just as the policies of affected local jurisdictions must be used to determine impact significance.

b. City of Mountain View

The Circulation Chapter/Element of the City of Mountain View General Plan states specific goals, policies and actions designed to maintain acceptable traffic operations and to reduce congestion. Improved circulation is expected to be provided through enhancement of transit, bicycle, and pedestrian modes, as well as the use of aggressive Transportation Demand Management measures to reduce single-occupant vehicle trips. This document establishes the level of service standards for local roadways (LOS D), acknowledges higher levels of congestion on regional roadways (LOS E standard), and includes plans for future bicycle facilities and walkways. These standards were used to develop significance criteria presented in the subsequent impacts discussion section of this EIS.

The City of Mountain View and the VTA have expressed interest in pursuing a new vehicle connection between the Shoreline Boulevard area (also known

as North Bayshore) and Moffett Boulevard. The City has referenced this connection in two previously published documents. Policy 24 under Goal J of the General Plan is "Reinforce NASA/Ames as an important institutional citizen of Mountain View." Action 24.d under this policy calls for "creation of a link between the North Bayshore area and the entrance to NASA/Ames." Although an existing pedestrian/bicycle connection is currently provided via a bridge at the east end of Charleston Road, the new link is intended to be a full vehicular connection.

A new link between the North Bayshore area and Moffett Boulevard is also referenced in the North Bayshore Area Precise Plan Environmental Impact Report. The analysis cited in this document indicated that the projected reductions in Shoreline Boulevard traffic with a Charleston Road bridge and a Crittendon Lane bridge would more than offset any increases caused by traffic originating from NASA. Provision of even one bridge was expected to divert more than 50 percent of the total diverted traffic with both extensions. However, this analysis did not assume redevelopment of the Ames Research Center site with the land uses proposed under any of the project build alternatives.

According to City of Mountain View staff, VTA and Caltrans have also expressed interest in a new link on the east side of Highway 101 to allow for a redistribution of local traffic between the Shoreline Boulevard and Moffett Boulevard interchanges, as well as to reduce the possibility of local trips using the freeway.

c. City of Sunnyvale

Circulation issues for the City of Sunnyvale are listed in the Land Use and Transportation Element of the General Plan. The goals, policies and action statements in this document delineate the operating standard for City streets (LOS D) and regional roadways (LOS E). Specific action items call for participating in coordinated regional land use and transportation planning, supporting alternative modes of transportation, optimizing the use of existing transportation facilities to minimize roadway widenings, and integrating

complementary land uses to reduce overall travel and enhance the community environment.

d. County of Santa Clara

The County of Santa Clara maintains roadways in unincorporated areas and expressway facilities. The only County maintained roadways included in this study are Central Expressway and Manila Drive. The County strives to maintain an LOS D standard for roadway operations, and also follows the CMP criteria for regional facilities. The addition of a high occupancy vehicle lane on the Central Expressway has been identified in the Valley Transportation Plan (VTP) 2020 published by VTA in December 2000.

2. State Regulations and Policies

Caltrans has jurisdiction over all state routes including interstate freeways (Interstate 280), US Highways (Highway 101), and state highways (State Routes 85 and 237). Caltrans strives to maintain LOS C operations on all of its facilities but acknowledges that numerous roadway segments under its control in urban areas will operate at LOS D or worse. Any modifications to facilities within the Caltrans right-of-way must be approved by the State. Although impacts to freeway segments are identified as part of the transportation impact analysis process established by the VTA, Caltrans can request additional information to determine anticipated impacts to State facilities. Caltrans maintains an environmental review section to address new developments in local jurisdictions.

3. Federal Regulations and Policies

Roadways within Ames Research Center are under the governance of NASA. Previous publications by the Federal Highway Administration and the Federal Transit Authority indicated that operations of all transportation facilities are typically designed and maintained based on standard engineering practice and may adhere to local standards. However, the federal government does not employ its own specific standards for intersection operation or other modes that would be used to identify significant environmental impacts. For this

study, criteria for the local, county, and State jurisdictions was used to maintain consistency with current planning efforts.

C. Existing Transportation System

This section describes the existing transportation characteristics of Ames Research Center and the surrounding area. The transportation system includes the freeways, streets, bus and rail transit facilities and services, and bicycle and pedestrian routes that form both the regional and internal networks at Ames Research Center. The proposed development alternatives would have varying impacts on the transportation facilities and their operations, as analyzed in Section 4.3.

Highway 101 is a major north-south route through the San Francisco Bay Area, although it is located on an east-west alignment in the proximity of Ames Research Center. For purposes of this analysis, Highway 101 is referenced as a north-south facility, while arterial roadways such as Moffett Boulevard and Ellis Street are referenced as east-west facilities regardless of their alignment. The other major freeways within the study area are Highway 85 and Highway 237. Highway 85 is a north-south facility that intersects Highway 101 just west of Ames Research Center, while Highway 237 is an east-west facility that intersects with Highway 101 near the southeast corner of Ames Research Center property.

The primary access points to Ames Research Center are provided along Highway 101 at the Moffett Boulevard and Ellis Street interchanges. The main gate to Ames Research Center is located on Moffett Boulevard, which provides direct connections to both Highway 101 and Highway 85. A second primary gate is located on Ellis Street, which provides a direct connection to Highway 101. The Ellis Street gate may also be accessed from Highway 237 via the Mathilda Avenue interchange and Manila Drive/Moffett Park Drive. Secondary gates are located to the west of Moffett Boulevard (Gate 17) and along the eastern boundary on 5th Avenue west of H Street. (near Lockheed-

Martin). More detailed descriptions of the various transportation facilities are presented below.

1. Roadways

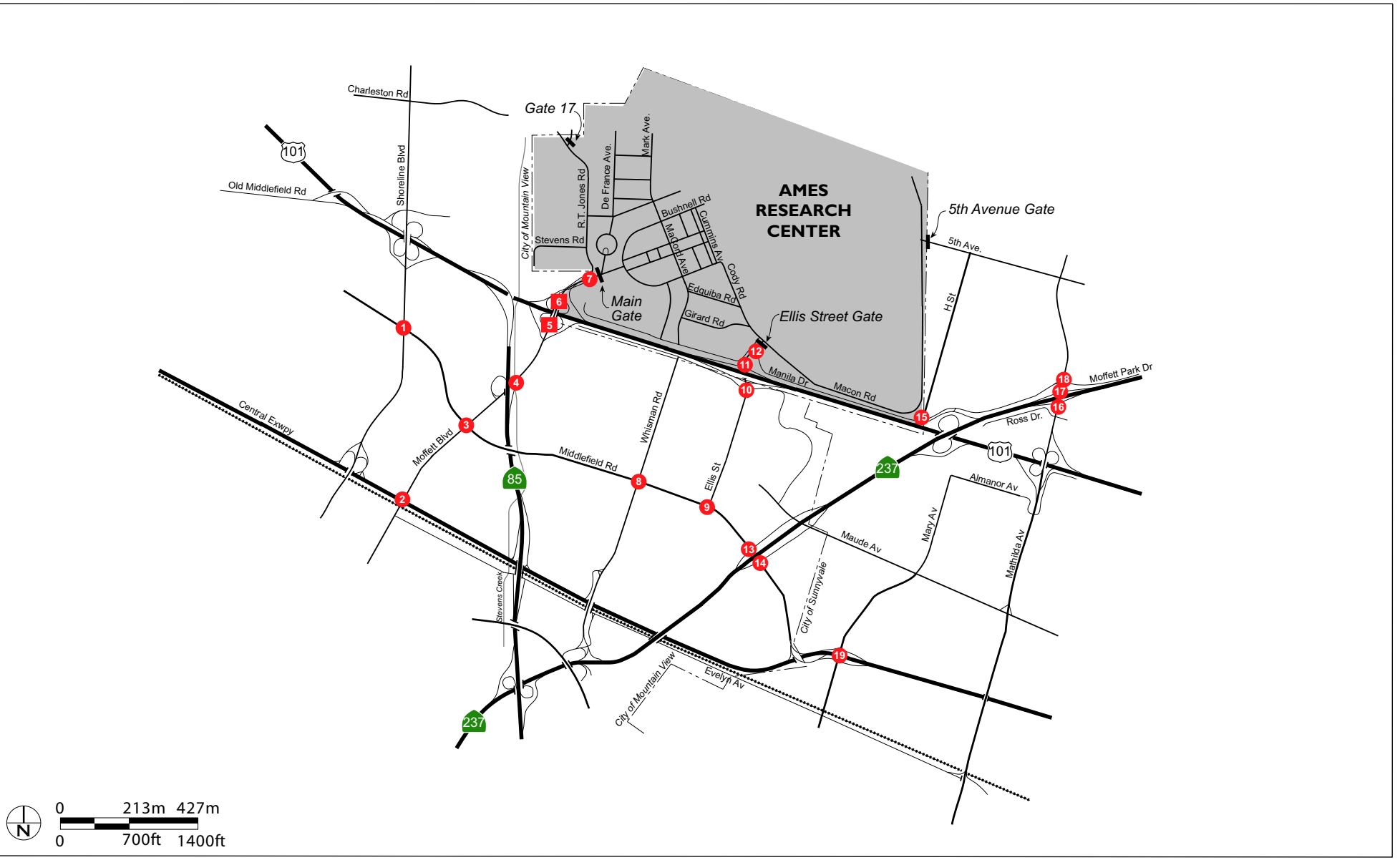
This section describes roadways and intersection condition within the traffic study area.

a. Regional Roadway Network

The major regional roadways that are most significant for Ames Research Center are summarized below and illustrated on Figure 3.3-1.

Highway 101: A major north-south route through California extending from Los Angeles to the Oregon state line. North of the project site, Highway 101 provides connections to cities throughout San Mateo County and San Francisco. To the south, it provides connections to Santa Clara, San Jose, and Central Coast communities. Within the study area, Highway 101 is a freeway with four lanes in each direction, with the median lanes designated as high occupancy vehicle (HOV) lanes during the morning (5:00 a.m. to 9:00 a.m.) and evening (3:00 p.m. to 7:00 p.m.) commute periods on weekdays.

State Route (SR) 85: A circumferential, north-south freeway that originates at Highway 101 near Ames Research Center and extends south and east, reconnecting to Highway 101 in south San Jose near Bernal Road. From Ames Research Center, Highway 85 provides connections to Sunnyvale, Cupertino, Saratoga, Los Gatos, Campbell and southern San Jose. For most of its length and within the study area, Highway 85 is a six-lane facility with median lanes designated as HOV lanes during the peak commute periods. Ramps to and from the south on Highway 85 are provided on Moffett Boulevard southeast of Highway 101. The complex existing Highway 85 interchange at Highway 101 near Ames Research Center causes substantial peak period congestion because of outdated interchange designs, numerous vehicular weaving movements, and the close proximity of the Shoreline Boulevard and Moffett Boulevard interchanges on Highway 101. VTA plans to upgrade this interchange.



Source: Fehr & Peers Associates, Inc.

4 Study Intersections
5 Future Study Intersections (Moffett/ Highway 101 Ramps)

FIGURE 3.3-1

STUDY INTERSECTIONS

State Route (SR) 237: An east-west facility located to the southeast of Ames Research Center, extending between Highway 85 and Highway 680. This facility serves regional traffic between Milpitas and southern Alameda County, and the large employment base in northern Santa Clara, Sunnyvale and Mountain View. On the segment between Highway 101 and Highway 880, Highway 237 is primarily a six-lane freeway, with the median lanes designated as HOV lanes during the peak weekday commute periods. Access from Ames Research Center to Highway 237 is typically provided via Highway 101 from either the Ellis Street or Moffett Boulevard interchanges, although direct access is provided via Manila Drive/Moffett Park Drive and the Highway 237/Mathilda Avenue interchange.

Moffett Boulevard: A four-lane arterial street that extends between Central Expressway near downtown Mountain View and the primary gate access into Ames Research Center. South of Central Expressway, Moffett Boulevard is designated as Castro Street. At the main gate, Moffett Boulevard becomes Clark Memorial Drive, and R. T. Jones Road (the Moffett Boulevard Extension) extends north/west of the main gate. Regional access to Ames Research Center from Moffett Boulevard is provided via interchanges with both Highway 101 and Highway 85 (to and from the south only).

Ellis Street: A four-lane arterial extending between Ames Research Center east of Highway 101 and Middlefield Road in Mountain View. A full-access interchange is provided at Highway 101 through which the existing VTA Light Rail Line operates. A 24-hour security gate is located at the eastern terminus of Ellis Street between Manila Drive and Macon Road (the existing airfield roadway parallel to Highway 101).

Manila Drive/Moffett Park Drive: A two-lane, public access roadway extending between Ellis Street and Mathilda Avenue along the edge of Ames Research Center that is generally parallel to Highway 101 and the VTA Light Rail Line. It provides access to the new LRT station and a connection between Ames Research Center and Mathilda Avenue. West of H Street, this street is

designated as Manila Drive; between H Street and Mathilda Avenue, it is known as Moffett Park Drive.

H Street: A two-lane roadway extending between Manila Drive and 3rd Avenue east of the airfield. This street crosses the VTA Light Rail Line.

5th Avenue: A two-lane roadway linking Macon Road within the airfield to Borregas Drive east of Mathilda Avenue. A security gate is located at the west end of the street. This street also crosses the VTA Light Rail Line at Mathilda Avenue.

Mathilda Avenue: A multi-lane arterial located southeast of Ames Research Center that extends between Caribbean Drive and Sunnyvale Avenue in the City of Sunnyvale. Mathilda Avenue includes full-access interchanges at both Highway 101 and Highway 237, and is a major corridor serving the extensive employment base in the Moffett Park area south and east of Ames Research Center. The closely-spaced intersections of Moffett Park Drive, the Highway 237 ramps, and Ross Drive result in substantial congestion during peak periods due to complex signal phasing and very short vehicle storage lengths. The secondary access gate serving Ames Research Center (the Eastside/Airfield area) can be accessed from Mathilda Avenue via 5th Avenue.

Middlefield Road: A two- to four-lane arterial roadway that extends from Winslow Avenue in Redwood City to the Central Expressway interchange in the City of Sunnyvale. Middlefield Road is roughly parallel to Highway 101, and includes at-grade intersections at Moffett Boulevard and Ellis Street. Through the study area, Middlefield Road has two lanes in each direction.

Central Expressway: A four-lane limited access facility extending from southeast of Charleston Road in the City of Palo Alto to De La Cruz Boulevard in the City of Santa Clara. This facility provides a local alternate to Highway 101, and includes an at-grade intersection at Moffett Boulevard, as well as grade-separated interchanges at Highway 85 (to and from the north only) and Middlefield Road.

The study intersections and freeway segments analyzed for this project are illustrated on Figure 3.3-1.

b. Site Access

Access into Ames Research Center is currently limited to a number of entry gate locations. The hours of operation for these gates vary by location. The gate locations are illustrated in Figure 3.3-1, which also shows some of the internal roadway network.

- **Main Gate.** Main Gate is located on Moffett Boulevard/Clark Memorial, east of the Highway 101 freeway interchange. It is open 24 hours a day, 7 days per week.
- **Ellis Street Gate.** Ellis Street Gate is located east of Highway 101 on Ellis Street. It is open 6 a.m. to 6 p.m., Monday through Friday.
- **Gate 17.** Gate 17 is located off of R.T. Jones Road, west of the Main Gate. It is open 6 a.m. to 6 p.m., Monday through Friday.
- **East Gate.** The East Gate (also referred to as the Lockheed-Martin Gate), is located at 5th Avenue along the eastern boundary of Ames Research Center. It is open 5:00 a.m. to 5:00 p.m., Monday through Friday.

Once inside the Ames Research Center, additional security gates are in place to control access to the Ames Campus and Eastside/Airfield.

c. Internal Roadway Network

The internal roadway system of interest includes the roadway network within the NRP, Ames Campus, Bay View, and Eastside/Airfield areas (see Figures 1-4 through 1-7). For purposes of this analysis, the NRP is assumed to be bounded by Highway 101, Moffett Boulevard/Clark Memorial Drive/Bushnell Road, and Cody Road/Macon Road. The Ames Campus area is located north of Clark Memorial Drive and Bushnell Road, and east of R.T. Jones Road.

As part of the data collection program for this study, an inventory of existing traffic control devices on selected roadway segments within Ames Research

Center was conducted in 1999 and 2000. The inventory included traffic signs and pavement and curb markings. Other traffic features, such as barriers and traffic signals, were observed within the context of the inventory. In concert with the inventory process, traffic control devices were evaluated for compliance with currently accepted standards for content and placement. Specifically, the most recent editions of the *Caltrans Traffic Manual, Caltrans Sign Specifications, and the Federal Highway Administration (USDOT) Manual of Uniform Traffic Control Devices (MUTCD)* were consulted. These state and federal guidelines are generally consistent.

As a federal facility, Ames Research Center has not been subject to typical civilian standards in the design and application of traffic control devices. Numerous substandard applications of traffic control devices and signage were observed. In some instances, substandard applications can lead to safety and traffic problems. Accident records maintained by NASA suggest no major existing traffic safety problems within Ames Research Center, due in part to the current low traffic volumes. However, there are several locations where turning radii and other operational features could be improved (e.g., right-of-way at the intersection of Clark Memorial Drive, Bushnell Road, North Akron Road, South Akron Road, and Westcoat Road can be confusing for first time visitors) (see Figures 1-4 through 1-7).

i. NRP and Ames Campus Areas

The existing internal road system within the NRP area was designed incrementally by the Navy as the base developed since its creation in 1930, and in the Ames Campus area by NASA since 1940. The Navy and NASA, unlike the civilian sector, were not restricted by property lines, easements, or design and aesthetic standards. In addition, the travel patterns associated with past Navy operations at the site are not necessarily the same as those that might be produced by the proposed development. This has resulted in a roadway system that may, in some instances, not be compatible with the proposed project land uses.

Most internal roadways have two lanes (one in each direction), with several four lane roads. Although the roadways and parking facilities in the NRP area were initially designed to serve the Navy's unique needs, the vehicle network is fairly structured. In the Shenandoah Historic District bounded by Bushnell Road, Westcoat Road, and Cummins Avenue, roads are laid out in a grid pattern, and often have curbs and sidewalks. In other parts of the NRP and Ames Campus areas, the roads form a less structured pattern, and many lack finished curbs and sidewalks.

ii. Bay View

The street system near the Bay View area is limited. Direct access to the Bay View area is provided by Parsons Avenue, DeFrance Avenue, Lindbergh Avenue, and Victory Road. These facilities are generally two-lane roadways serving low traffic volumes. In some cases, these roads do not have sidewalks or finished curbs and gutters. The only external access point near the Bay View area is a pedestrian/bicycle bridge over Stevens Creek to the west that connects to Charleston Road.

iii. Eastside/Airfield

The primary roadway in the Eastside/Airfield area is Macon Road, which provides access to Hangars 2 and 3, as well as the golf course. East Patrol Road crosses Macon Road and provides local access to the remaining uses in this area. Direct external access to adjacent public areas is provided by the East Gate on 5th Avenue.

d. Intersection Analysis Methodology

The methodologies used for this EIS follow the standards and guidelines of the Cities of Mountain View and Sunnyvale. They also follow the methodologies described in *Transportation Impact Analysis Guidelines* and *Traffic Level of Service Analysis Guidelines* produced by the Valley Transportation Authority (VTA). The VTA administers the County's Congestion Management Program (CMP) and monitors the impact of land use decisions by the member jurisdictions. The methodology for evaluating intersection performance is described below.

The operation of roadways is governed by the function of intersections, which represent the constraint points of the roadway network. The operating conditions of the key intersections were evaluated with level of service (LOS) calculations. Level of service is a qualitative description of an intersection's operation ranging from LOS A, or free-flow conditions, to LOS F, or congested conditions.

The intersection level of service methodology used in this analysis to evaluate signalized intersections is the approved VTA methodology, which has been adopted by the Cities of Mountain View and Sunnyvale. This method evaluates an intersection's operation based on the average stopped vehicular delay calculated using the procedure described in Chapter 9 of the 1985 *Highway Capacity Manual* (HCM), with saturation flow rates adjusted to reflect local (Santa Clara County) conditions per VTA guidelines. The average delay for signalized intersections is calculated using the TRAFFIX analysis software, and is correlated to a level of service designation as shown in Table 3.3-1. The "+" and "-" symbols are a more detailed description of delay ranges within each service level, and are not referenced in the text to simplify the discussion (e.g., LOS E+ is referred to as LOS E in the text). A "+" indicates that the intersection is on the better end of the range for a particular LOS, with shorter delays, while a "-" indicates that the intersection is on the worse end of the range for a particular LOS.

Operations of unsignalized intersections were calculated using the procedures outlined in Chapter 10 of the 1997 Update to the HCM. The LOS rating is based on the average control delay for each minor street movement measured in seconds per vehicle. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For all-way stop control intersections, level of service is defined for the intersection as a whole based on a weighted average control delay. Only the worst-case delay is used to identify LOS for two-way stop controlled intersections (i.e. stop signs on the minor street approaches). The previous 1994 HCM methodology measured "total" delay, which includes queue move-up time and stopped delay. Consequently, the delay ranges have been adjusted upward from the 1994

HCM delay ranges to account for initial deceleration delay and final acceleration delay. Table 3.3-2 presents the range of control delay that corresponds to each LOS designation.

Roadway system deficiencies and impacts are defined as occurring where the calculated LOS falls below the acceptable level of performance. The VTA has established LOS E as the standard for CMP facilities. CMP-designated intersections include Central Expressway/Moffett Boulevard-Castro Street and Central Expressway/Mary Avenue. In general, both Mountain View and Sunnyvale consider LOS D to be the minimum acceptable level of peak hour operation for signalized intersections on non-CMP routes. In addition, the City of Sunnyvale strives to maintain any existing acceptable LOS (i.e., A, B, and C) at intersections where feasible. Neither VTA nor the cities have established a minimum LOS standard for stop-sign controlled intersections. However, typical practice in these jurisdictions has been to accept LOS E operation for a particular movement or shared approach, but to investigate the possibility of signalization in cases where LOS F operations occur or are projected. Caltrans warrant criteria in the *Traffic Manual* are used to help identify the need for signalization, especially in cases where vehicles on the minor street approaches are expected to experience extensive delay.

e. Existing Intersection Volumes and Level of Service

Peak-period turning movement counts were conducted during October and November 1999 for all but six of the study intersections. New counts were conducted at the following locations in July 2000:

- Middlefield Road/Shoreline Boulevard
- Middlefield Road/Whisman Road
- Middlefield Road/Ellis Road
- Middlefield Road/Highway 237 eastbound Ramps
- Central Expressway/Moffett Boulevard (AM peak hour only)

TABLE 3.3-1 **SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS**

Level of Service	Average Delay Per Vehicle (Seconds)	Description
A	# 5.0	Operations with very low delay occurring with favorable progression and/or short cycle length.
B+ B B-	5.1 to 7.0 7.1 to 13.0 13.1 to 15.0	Operations with low delay occurring with good progression and/or short cycle lengths.
C+ C C-	15.1 to 17.0 17.1 to 23.0 23.1 to 25.0	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.
D+ D D-	25.1 to 28.0 28.1 to 37.0 37.1 to 40.0	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.
E+ E E-	40.1 to 44.0 44.1 to 56.0 56.1 to 60.0	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.
F	> 60.0	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.

Source: VTA, *CMP Transportation Impact Analysis Guidelines*, May 7, 1998, and Transportation Research Board, *Highway Capacity Manual*, Special Report 209, 1985.

TABLE 3.3-2 **LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS**

Level of Service	Average Control Delay per Vehicle (Seconds)
A	# 10
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	> 50

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report 209, 1994 (adjusted for the 1997 update to Chapter 10).

At the Central Expressway/Mary Avenue intersection, peak hour count data were obtained from the VTA's 2000 CMP Monitoring and Conformance data files.

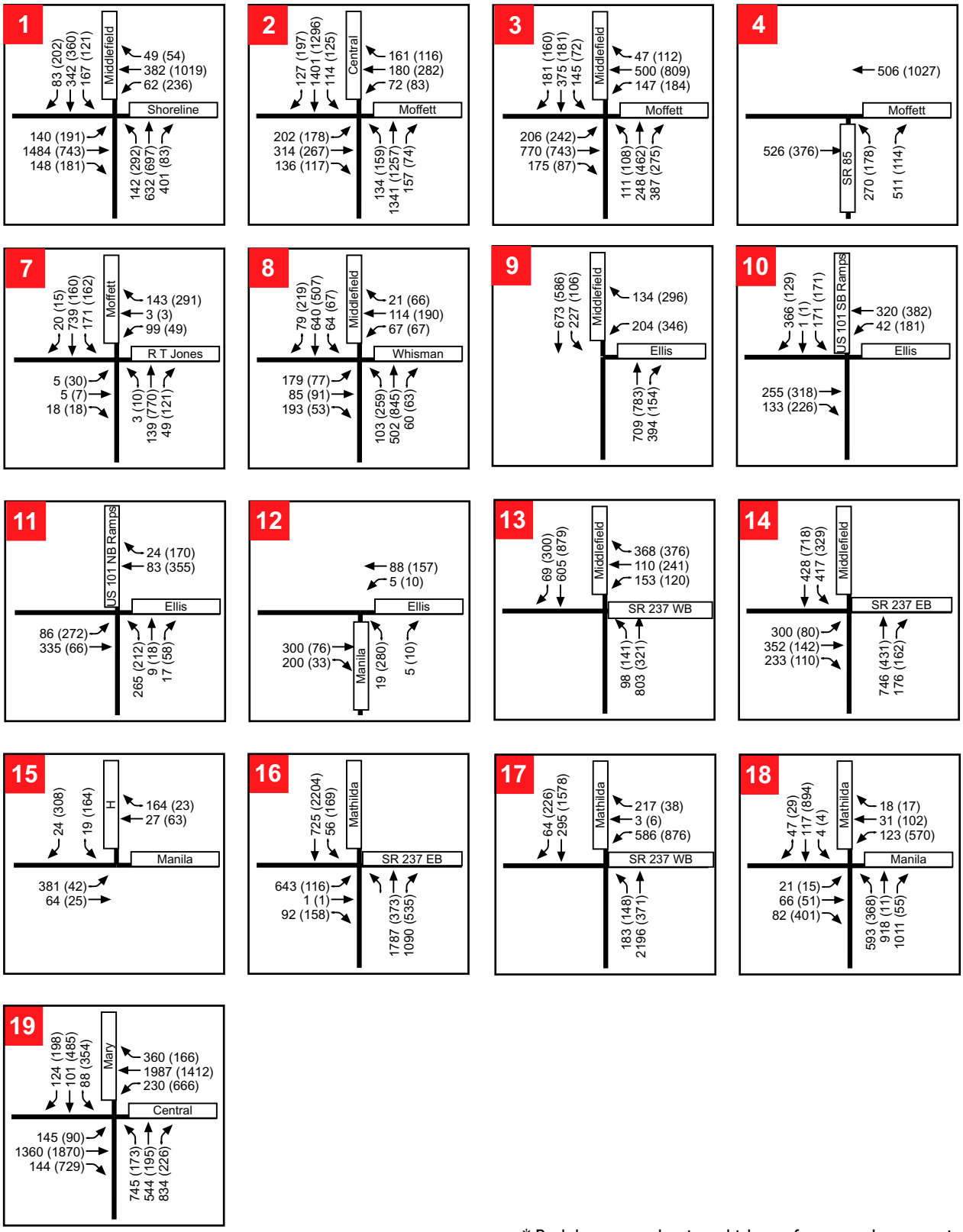
All counts were conducted during the morning (7:00 a.m. to 9:00 a.m.) and evening (4:00 p.m. to 6:00 p.m.) peak periods. The one-hour timeframe where the highest volumes are counted during each period is referred to as the peak hour (e.g., 7:30 a.m to 8:30 a.m.). Existing AM and PM peak hour traffic volumes are shown in Figure 3.3-2 for all of the study intersections. The existing lane configurations at each intersection are illustrated on Figure 3.3-3.

The existing volumes were used with the lane configurations to evaluate the current operations of the key intersections. The results of the intersection analysis are presented in Table 3.3-3, and the corresponding level of service calculation sheets are contained in Appendix B.

TABLE 3.3-3 **EXISTING SIGNALIZED INTERSECTION LEVEL OF SERVICE**

	Intersection	Peak Hour	Count Date	Delay	LOS
1.	Middlefield Rd/ Shoreline Blvd	AM PM	July 2000 July 2000	37.0 41.5	D E+
2.	Moffett Blvd-Castro St/ Central Expressway	AM PM	July 2000 April 2000	31.4 32.5	D D
3.	Moffett Blvd. Middlefield Rd.	AM PM	November 1999 November 1999	27.0 25.5	D+ D+
4.	Moffett Blvd./Hwy 85 NB Off-Ramp	AM PM	November 1999 November 1999	9.8 5.5	B B+
7.	Moffett Blvd-Clark Memorial Dr./R.T. Jones Rd. (unsignalized)	AM PM	November 1999 November 1999	14.4 22.8	B C
8.	Middlefield Rd./Whisman Rd.	AM PM	July 2000 July 2000	12.5 12.6	B B
9.	Ellis St./Middlefield Rd.	AM PM	July 2000 July 2000	11.3 12.3	B B
10.	Ellis St./Hwy 101 SB Ramps(unsignalized)	AM PM	November 1999 November 1999	17.4 16.0	C C+
11.	Ellis St./Hwy 101 NB Ramps	AM PM	November 1999 November 1999	9.1 8.0	B B
12.	Ellis St./Manilla Dr. (unsignalized)	AM PM	November 1999 November 1999	8.1 9.6	A A
13.	Middlefield Rd./Hwy 237 WB Ramps	AM PM	November 1999 November 1999	15.0 14.8	B- B-
14.	Middlefield Rd./Hwy 237 EB Ramps	AM PM	July 2000 July 2000	16.8 12.5	C+ B
15.	Manila St./H St.	AM PM	November 1999 November 1999	7.7 7.5	B B
16.	Mathilda Ave./Hwy 237 EB Ramps	AM PM	November 1999 November 1999	14.3 10.9	B- B
17.	Mathilda Ave./Hwy 237 WB Ramps	AM PM	November 1999 November 1999	15.8 20.5	C+ C
18.	Mathilda Ave./Moffett Park Dr.	AM PM	November 1999 November 1999	14.8 27.6	B- D+
19.	Central Expy./Mary Ave.	AM PM	October 1999 April 2000	50.2 41.8	E- E+

Notes:
1. Whole intersection weighted ave. stopped delay expressed in seconds/vehicle for signalized intersections, and total control delay in seconds/vehicle for unsignalized intersections.
2. LOS calculations for signalized intersections performed using the 1985 Highway Capacity Manual methodology contained in the TRAFFIX software package with adjusted saturation flow rates to reflect local conditions.
3. LOS calculations for unsignalized intersections performed using the 1997 Highway Capacity Manual methodology contained in the TRAFFIX software package.
4. Intersections 4 and 5 (Moffett Boulevard/Highway 101 NB Ramps and Moffett Boulevard/ Highway 101 SB Ramps) are future intersections to be constructed.



not to scale

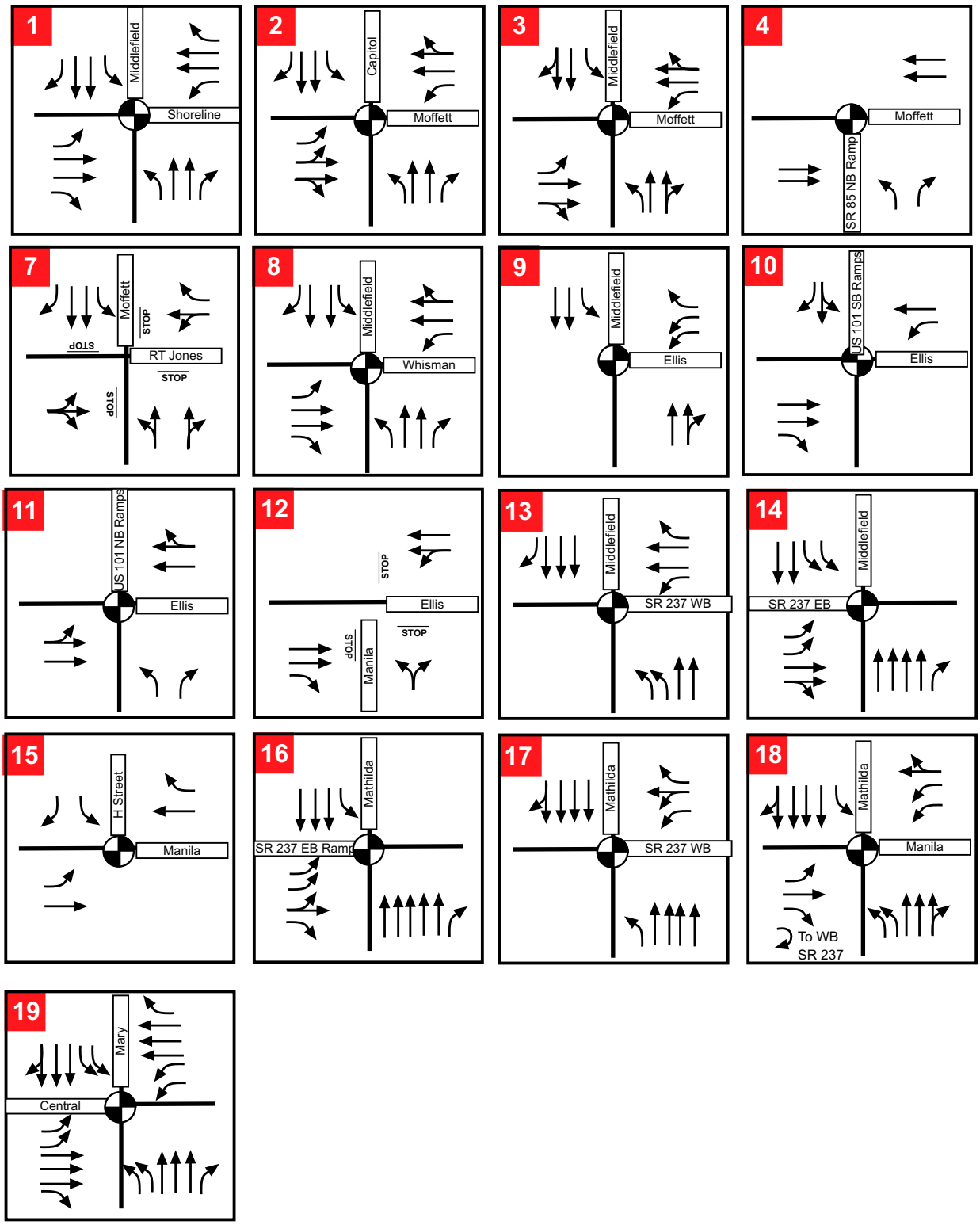
* Peak hours are the times highest of measured consecutive one-hour volumes between 7:00-9:00 am and 4:00-6:00 pm.

Source: Fehr & Peers Associates, Inc.

XX (YY) = AM (PM) Peak Hour* Traffic Volumes

FIGURE 3.3-2

EXISTING AM/PM PEAK HOUR TRAFFIC VOLUMES



not to scale

Source: Fehr & Peers Associates, Inc.

Traffic Signal

FIGURE 3.3-3

EXISTING LANE CONFIGURATIONS

As shown in Table 3.3-3, only one of the external study intersections currently operates at a deficient level according to the technical calculations: The Middlefield Road/Shoreline Boulevard intersection operates at LOS E during the PM peak hour, while all other intersections operate at acceptable levels during both peak hours. It should be noted however, that several locations are considered to operate at worse levels of service based on field observations. At the Moffett Boulevard-Castro Street/Central Expressway intersection, normal traffic signal cycle operations are periodically disrupted by crossing gates closing the south leg of the intersection to accommodate Caltrain passenger rail operations. This activity increases delay for some movements and worsens overall LOS. It can take several cycles or more for operations to return to normal until the next train requires lowering of the crossing arms.

The relatively good levels of service calculated for the Mathilda Avenue/Moffett Park Drive intersection (LOS D or better) do not correspond with field observations that show some lengthy delays caused by downstream vehicle queuing and the close proximity of four traffic signals near the vicinity of the Mathilda Avenue/Highway 237 interchange. Additional through capacity is required under existing conditions to minimize queuing and provide acceptable operations during both peak periods. Operations at this location with the addition of traffic from cumulative projects are discussed in the section on Future Cumulative Conditions.

Lastly, the stop-sign controlled intersection at Moffett Boulevard-Clark Memorial Drive and Moffett Boulevard Extension, which is essentially internal to Ames Research Center, does experience some back-ups during both peak periods. However, these delays are caused by security checks of vehicles and are typically temporary and not excessive. Several vehicles may queue at the security gate, but overall operations are not compromised.

f. Existing Freeway Analysis Methodology and Operations

Per the VTA guidelines, the method for evaluating freeway operations is based on density expressed as passenger cars per mile per lane. The LOS criteria for freeway operations, shown in Table 3.3-4, are based on the criteria from the

TABLE 3.3-4 **DENSITY-BASED FREEWAY LEVEL OF SERVICE CRITERIA**

Level of Service	Density (vehicles per mile per lane)
A	10
B	10.0 < density # 16.0
C	16.0 < density # 24.0
D	24.0 < density # 46.0
E	46.0 < density # 55.0
F	> 55.0

Source: Transportation Impact Analysis Guidelines (VTA Congestion Management Program Guidelines, May 7, 1998).

1994 HCM, with some modifications based on an evaluation of field data conducted by VTA. Similar to intersections, freeway segments were analyzed for both the AM and PM peak hours.[1] All of the U. S. Highway 101, SR 237, and SR 85 freeway segments in the immediate vicinity of the project site were analyzed, in accordance with requirements described in the VTA's *Transportation Impact Analysis Guidelines.*

Freeway segment volumes and LOS were taken directly from the VTA's *2000 Monitoring and Conformance Report.* The AM and PM peak hour LOS for the selected freeway segments are shown in Table 3.3-5.

Several of the freeway segments in the vicinity of Ames Research Center operate at LOS F during one or both peak periods. These results illustrate the high level of existing congestion on the area's freeway system, particularly

[1] Peak hour analyzed varies by freeway segment. This analysis uses the highest one-hour totals between 6:30 am and 9:30 am and between 3:30 pm and 6:30 pm for each segment.

Table 3.3-5
Existing Freeway Operations (Near Site)

Freeway	Segment	Direction	Peak Hour	Existing[1] Lanes	Volume	Average Speed	Density	LOS[2]
US 101	North of Lawrence	NB	AM	3	4,675	60	27	D
US 101	North of Lawrence	NB	PM	3	5,675	60	33	D
US 101	Moffett to SR 85	NB	AM	3	3,960	15	88	F
US 101	Moffett to SR 85	NB	PM	3	4,550	15	101	F
US 101	Moffett to SR 85	SB	AM	3	6,900	50	46	D
US 101	Moffett to SR 85	SB	PM	3	5,940	55	36	D
US 101	Moffett to SR 85	NB HOV	AM	1	1,340	15	89	F
US 101	Moffett to SR 85	NB HOV	PM	1	1,960	40	49	E
US 101	Moffett to SR 85	SB HOV	AM	1	1,800	60	30	D
US 101	Moffett to SR 85	SB HOV	PM	1	1,440	60	24	C
US 101	SR 237 to Moffett	NB	AM	3	3,960	15	88	F
US 101	SR 237 to Moffett	NB	PM	3	4,500	25	60	F
US 101	SR 237 to Moffett	SB	AM	3	4,950	25	66	F
US 101	SR 237 to Moffett	SB	PM	3	5,940	55	36	D
US 101	SR 237 to Moffett	NB HOV	AM	1	1,440	20	72	F
US 101	SR 237 to Moffett	NB HOV	PM	1	1,380	60	23	C
US 101	SR 237 to Moffett	SB HOV	AM	1	1,620	60	27	D
US 101	SR 237 to Moffett	SB HOV	PM	1	1,260	60	21	C
US 101	Mathilda to SR 237	NB	AM	3	4,740	20	79	F
US 101	Mathilda to SR 237	NB	PM	3	5,040	60	28	D
US 101	Mathilda to SR 237	SB	AM	3	6,450	50	43	D
US 101	Mathilda to SR 237	SB	PM	3	5,220	60	29	D
US 101	Mathilda to SR 237	NB HOV	AM	1	1,790	35	51	E
US 101	Mathilda to SR 237	NB HOV	PM	1	1,200	60	20	C
US 101	Mathilda to SR 237	SB HOV	AM	1	1,680	60	28	D
US 101	Mathilda to SR 237	SB HOV	PM	1	1,320	60	22	C
SR 85	Central Expwy to US 10	NB	AM	2	3,160	20	79	F
SR 85	Central Expwy to US 10	NB	PM	2	2,080	65	16	B
SR 85	Central Expwy to US 10	SB	AM	2	1,560	65	12	B
SR 85	Central Expwy to US 10	SB	PM	2	3,450	25	69	F
SR 85	Central Expwy to US 10	NB HOV	AM	1	980	65	15	B
SR 85	Central Expwy to US 10	NB HOV	PM	1	520	65	8	A
SR 85	Central Expwy to US 10	SB HOV	AM	1	780	65	12	B
SR 85	Central Expwy to US 10	SB HOV	PM	1	780	65	12	B
SR 237	Maude to US 101	WB	AM	2	3,120	60	26	D
SR 237	Maude to US 101	WB	PM	2	4,290	55	39	D
SR 237	Maude to US 101	EB	AM	2	3,250	25	65	F
SR 237	Maude to US 101	EB	PM	2	1,690	65	13	B
SR 237	US 101 to Mathilda	WB	AM	2	3,720	60	31	D
SR 237	US 101 to Mathilda	WB	PM	2	4,180	55	38	D
SR 237	US 101 to Mathilda	EB	AM	2	2,610	15	87	F
SR 237	US 101 to Mathilda	EB	PM	2	2,760	60	23	C
SR 237	Mathilda to N. Fair Oak	WB	AM	2	3,590	60	26	D
SR 237	Mathilda to N. Fair Oak	WB	PM	2	4,430	55	35	D
SR 237	Mathilda to N. Fair Oak	EB	AM	2	3,400	25	68	F
SR 237	Mathilda to N. Fair Oak	EB	PM	2	2,400	60	20	C
SR 237	Mathilda to N. Fair Oak	EB HOV	AM	1	1,620	60	27	D
SR 237	Mathilda to N. Fair Oak	EB HOV	PM	1	650	65	10	A

Notes:

[1] Lanes, volume and density from VTA 2000 CMP Monitoring Data.

[2] LOS based on speed presented in CMP monitoring report.

northbound on Highway 101. As noted previously, the complicated existing Highway 85 interchange at Highway 101 near Ames Research Center causes substantial peak period congestion because of outdated interchange designs, numerous vehicular weaving movements, and the close proximity of the Shoreline Boulevard and Moffett Boulevard interchanges on Highway 101. This interchange will be reconstructed as part of a planned regional improvement project.

Given the number of new employment opportunities generated by the proposed project, employees are expected to travel from outside the immediate south Bay Area to work at Ames Research Center. This travel could potentially affect freeway operations on the Peninsula (San Mateo County), in the East Bay and Central Valley (Alameda, Contra Costa, San Joaquin counties), and to the south (Santa Clara, Santa Cruz, and San Benito counties). To estimate the locations of potential freeway impacts and identify external study locations, project-generated commuter trips were distributed based on the projected residences of commuters to the Sunnyvale/Mountain View Superdistrict published by the Metropolitan Transportation Commission (MTC). (Trip distribution is described in more detail in the impacts discussion section.) Trips made by university students, on-site residents, and museum visitors were assumed to be more local (i.e. mostly within Santa Clara County), or would be made outside typical commute periods. Therefore, not all project-generated trips would be assigned to the furthest freeway segments.

Using a criterion of a one per cent or more increase in capacity, those freeway segments selected for analysis that are not immediately adjacent to the project site are presented in Table 3.3-6. Study segments were selected based on available traffic data and their location between freeway or major arterial interchanges. Existing data for these facilities was obtained from the VTA *2000 Monitoring and Conformance Report*, the Alameda County Congestion Management Program's *2000 Level of Service Monitoring Study*, and the San Mateo County Congestion Management Program's *1999 Monitoring Report.* It should be noted that the Alameda County data presents LOS based on speed for p.m. peak hours only, while San Mateo County data includes a speed- or

Table 3.3-6
Existing Freeway Operations (External Locations)

Freeway	Segment	Peak Hour	Existing Speed, Density, or V/C NB/EB	Existing Speed, Density, or V/C SB/WB	Existing LOS NB/EB	Existing LOS SB/WB	Existing HOV?	Number of Mixed-Flow Lanes NB/EB	Number of Mixed-Flow Lanes SB/WB
SR 85	Homestead to Fremont	AM	114.0	38.0	F	D	Y	2	2
		PM	34.0	55.0	D	E	Y	2	2
SR 85	Winchester to Saratoga	AM	75.0	28.0	F	D	Y	2	2
		PM	26.0	60.0	D	F	Y	2	2
SR 85	Almaden to Camden	AM	52.0	26.0	E	D	Y	2	2
		PM	34.0	34.0	D	D	Y	2	2
SR 17	Bear Creek to SR 9	AM	77.0	17.0	F	C	N	2	2
		PM	18.0	64.0	C	F	N	2	2
SR 87	Curtner to Almaden	AM	82.0	18.0	F	C	N	2	2
		PM	34.0	75.0	D	F	N	2	2
SR 87	Julian to Taylor	AM	173.0	14.0	F	B	N	2	2
		PM	17.0	29.0	C	D	N	2	2
US 101	Cochrane to Scheller	AM	59.0	24.0	F	C	N	3	3
		PM	31.0	29.0	D	D	N	3	3
US 101	Tully to Story	AM	113.0	22.0	F	C	Y	3	3
		PM	26.0	76.0	D	F	Y	3	3
US 101	McKee to Old Oakland	AM	134.0	17.0	F	C	Y	3	3
		PM	21.0	51.0	C	E	Y	3	3
US 101	DeLaCruz to Montague	AM	52.0	26.0	E	D	Y	3	3
		PM	33.0	116.0	D	F	Y	3	3
US 101	Oregon/Embarcadero to	AM	60.0	95.0	F	F	Y	3	3
	University	PM	88.0	91.0	F	F	Y	3	3
US 101	Woodside to Whipple	AM	58	32	E	F	Y	3	3
		PM	53	40	F	F	Y	3	3
SR 84	University to Alameda Co.	AM	0.45	1.45	A	F	N	3	3
	Line	PM	1.57	0.48	F	A	N	3	3
I-280	Saratoga to Lawrence	AM	79.0	39.0	F	D	Y	3	3
		PM	30.0	49.0	D	E	Y	3	3
I-680	SR 237 to Jacklin	AM	52.0	33.0	E	D	N	3	3
		PM	71.0	38.0	F	D	N	3	3
I-680	Scott Creek to SR 238	AM	N/A	N/A	N/A	N/A	N	3	3
		PM	47	66	D	A	N	3	3
I-680	SR 84 to Bernal	AM	N/A	N/A	N/A	N/A	N	3	3
		PM	58	63	B	A	N	3	3
I-680	I-580 to Alcosta	AM	N/A	N/A	N/A	N/A	N	3	3
		PM	66	62	A	A	N	3	3
I-580	I-205 to SR 84/1st	AM	N/A	N/A	N/A	N/A	N	4	4
		PM	50	61	C	A	N	4	4
I-580	Santa Rita to I-680	AM	N/A	N/A	N/A	N/A	N	4	4
		PM	13	65	F	A	N	4	4
I-880	SR 237 to Dixon	AM	25.0	32.0	D	D	N	3	3
		PM	68.0	29.0	F	D	N	3	3
I-880	Alv.-Niles to Tennyson	AM	N/A	N/A	N/A	N/A	N	4	4
		PM	24	59	F	B	N	4	4
SR 237	Zanker to McCarthy	AM	33.0	103.0	D	F	Y	3	3
		PM	102.0	30.0	F	D	Y	3	3
SR 237	FairOaks to Lawrence	AM	45.0	29.0	D	D	Y	2	2
		PM	21.0	33.0	C	D	Y	2	2

Notes:

[1] Lanes, speed (XX), density (YY.Y) and/or LOS (Z.ZZ) from VTA 2000 CMP Monitoring Data, Alameda County CMP 2000 LOS Monitoring Report, and San Mateo County CMP 1999 Monitoring Report.

[2] LOS based on density presented in VTA CMP monitoring report.

Capacity assumes 2,300 vehicles per hour per lane (vphpl) for six- or more lane freeways and 2,200 vphpl for four-lane freeways.

volume-to-capacity ratio-based LOS for both the a.m. and p.m. peak periods. As noted above, the detailed freeway analysis is included in the impacts discussion section of this EIS.

g. Internal Roadway Segment Levels of Service

With the closure of Moffett Field as a military base, most roadways within Ames Research Center carry only low volumes of traffic. Peak period volumes are typically less than 400 vehicles per hour in the peak direction. This level of traffic volume suggests no capacity issues on internal roads. Observations of key internal intersections also revealed no capacity or delay problems. Furthermore, it must be recognized that the proposed development plans would not only significantly change the travel patterns within the development area, but also involve re-design of the roadway network itself. For these reasons, the existing LOS for internal roadway facilities was not calculated, although observations suggest that all facilities operate at LOS B or better.

In addition, traffic counts were conducted at key segments throughout Ames Research Center and on local roadways adjacent to the study site, including the ramps at both the Moffett Boulevard and Ellis Street interchanges. A total of 27 segments were counted using automated tube counters. Data was collected for a minimum of three midweek days (Tuesday through Thursday) or 72 hours. The counts were conducted over a two-week period encompassing May 18 through May 20 and May 25 through May 27, 1999. In addition, re-counts were performed on July 28, 1999 at the four off-site segments along Moffett Boulevard plus the northbound ramps at the Moffett interchange. These re-counts were necessary because of errors in the original (May) count data. Table 3.3-7 summarizes the average weekday daily, AM peak hour, and PM peak hour results for all on-site segments. Saturday and Sunday counts were conducted at two locations and are also included in Table 3.3-7.

2. Existing Public Transit Service

The primary transit service provider in the Ames Research Center area is the VTA, which operates bus and Light Rail Transit (LRT) service throughout Santa Clara County. Existing service to Ames Research Center includes LRT

TABLE 3.3-7 **ON-SITE ROADWAY SEGMENT TRAFFIC VOLUMES**

Segment	Location	Direction	Daily	AM Peak	PM Peak	Sat.	Sun.
GATES							
Clark Memorial Drive	East of Main Gate	EB	8,376	856	227	7,194	5,283
		WB	8,987	211	901	6,022	5,244
Gate 17	East of R.T. Jones	EB	1,080	118	23		
		WB	1,229	23	212		
Ellis Street	East of Manila	EB	2,523	294	76		
		WB	2,256	93	157		
5th Avenue	West of Macon	EB	N/A	34	30		
		WB	N/A	18	43		
ON-SITE ROADWAYS							
R.T. Jones Road	North of Clark Memorial	NB	5,782	225	290	3,507	2,600
		SB	4,717	245	343	3,404	2,521
Arnold Avenue	North of Clark Memorial	NB	4,103	684	52		
		SB	1,266	0	229		
DeFrance Road	North of Bush Circle	NB	1,712	237	37		
		SB	2,046	44	249		
Mark Road	North of Bushnell	NB	2,174	303	42		
		SB	2,538	142	236		
King Road	East of DeFrance	EB	565	56	15		
		WB	573	38	35		
Bushnell Road	East of Clark Memorial	EB	346	24	6		
		WB	2,280	47	350		
North Akron Road South Akron Road	East of Clark Memorial	EB	3,152	108	312		
		WB	4,073	463	187		
Westcoat Road	East of Clark Memorial	NB	2,256	154	137		
		SB	513	21	45		
Girard Road	West of Cody	NB	205	19	16		
		SB	157	19	11		
Edquiba Road	West of Cody	NB	1,536	52	103		
		SB	1,404	63	131		
Cody Road	North of Edquiba	NB	2,152	215	121		
		SB	2,055	99	192		
Macon Road	East and North of Ellis	NB	1,186	32	105		
		SB	1,119	101	40		
	North of 5th Avenue	NB	977	81	35		
		SB	977	29	72		

Source: NASA, 1999.

service plus several bus lines. LRT service is currently provided between downtown Mountain View and south San Jose. Service is provided 24 hours a day at 10-minute headways during the peak periods and 20-minute to 60-minute headways during other periods. The closest station to the project site is the Bayshore Station located near the Ellis Street/Manila Drive intersection, which includes a "kiss-and-ride" area. No shuttles service is currently provided between this station and the NRP or Ames Campus areas.

Only one bus transit route (Route 51) provides direct service to Ames Research Center. Route 51 operates between Vallco Fashion Park in Cupertino and the Ames Campus area, including service to downtown Mountain View. In the AM and PM peak periods, buses are routed through the ARC campus; during off-peak periods and weekends, buses loop through the Orion Park Military Housing area without entering ARC. Service is provided at 30- to 60-minute headways on weekdays and at 60-minute headways on weekends. Additional express and fixed-route bus service is provided in the Moffett Park area in Sunnyvale (Routes 26, 54, 122, 321, 328, and 520) and on Ellis Street, Whisman Road, and Middlefield Road (Routes 32, 48, 304, 305, and 345) in Mountain View. However, these routes do not provide service close enough to the project site to generate substantial ridership.

Regional transit service is provided via the Caltrain and Altamont Commuter Express (ACE) commuter rail systems. Caltrain operates between Gilroy and San Francisco, with the nearest station located in downtown Mountain View. NASA currently operates a shuttle between the Ames Campus area and the Mountain View Caltrain station. Shuttles currently run between 6:10 and 9:25 in the morning, and between 2:48 and 5:48 in the afternoon. The closest ACE rail station is the Great America station located on Lafayette Street at Tasman Drive. Patrons can transfer directly to the LRT at the Lick Mill station. Existing transit service within the study area is shown on Figure 3.3-4.

Specific VTA and Caltrain ridership data for Ames Research Center is somewhat limited. According to the VTA, a total of approximately 150 persons board and depart the LRT at the NASA/Bayshore Station. A total of

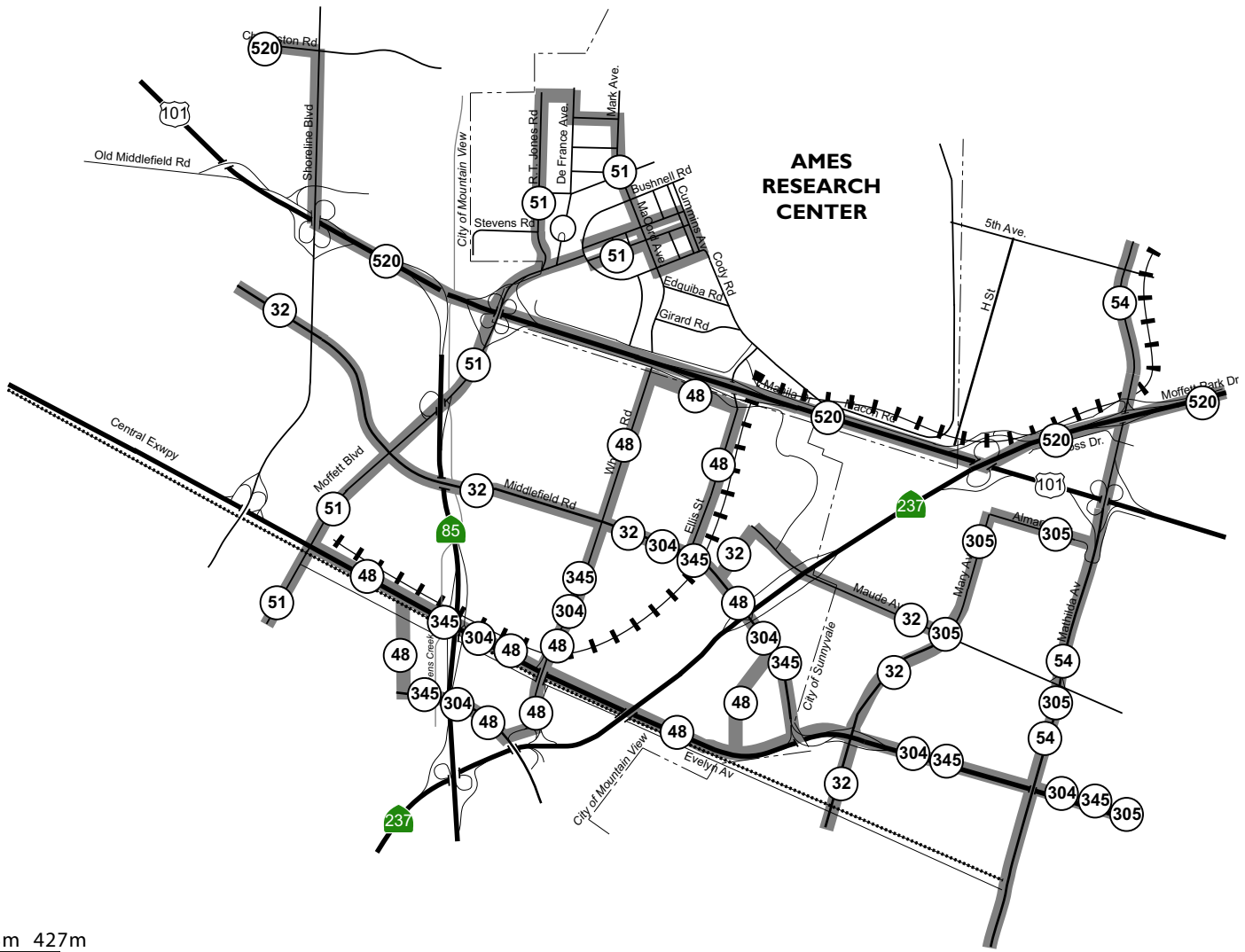
64 persons board and depart the Route 51 bus within Ames Research Center. In addition, approximately 100 people at Ames Research Center currently participate in NASA's transit pass subsidy program. Daily directional ridership on NASA's shuttle to Caltrain varies between 40 and 60 according to NASA staff. NASA's shuttle also goes to the LRT station.

3. Existing Bicycle and Pedestrian Facilities

Currently, there are bicycle facilities at two locations within Ames Research Center. In the north, there are marked bicycle lanes on Wright Avenue between the Moffett Extension and Hunsaker Road. To the south, a separate bicycle path was recently constructed adjacent to Macon Road between Ellis Street and the Lockheed Gate on 5th Avenue. Throughout the remainder of Ames Research Center, the low traffic volumes and the availability of sidewalks or shoulders provide a reasonable environment for pedestrians and cyclists, respectively.

The Santa Clara County Bikeways map identifies several bicycle facilities in the vicinity of Ames Research Center. To the west, the Stevens Creek Trail intersects with Moffett Boulevard and Middlefield Road, and both cyclists and pedestrians can access Ames Research Center via a bridge over the creek and a gate located in the housing area. The Stevens Creek Trail is currently a 5.6-kilometer (3.5 mile) trail extending between Shoreline Park and Landels School in downtown Mountain View, and is ultimately planned to be extended to Cupertino.

Moffett Boulevard is a designated bike route between the main gate of Ames Research Center and downtown Mountain View. Bike lanes have been marked on Moffett Boulevard beginning on the west side on the Highway 101 interchange. Bicycle travel through the Moffett Boulevard interchange is considered difficult because bicyclists must cross weaving vehicle traffic using the loop and high-speed direct ramps.



Source: Fehr & Peers Associates, Inc.

Cal Train

Light Rail

Bus Routes

FIGURE 3.3-4

EXISTING TRANSIT SERVICE

NASA AMES RESEARCH CENTER

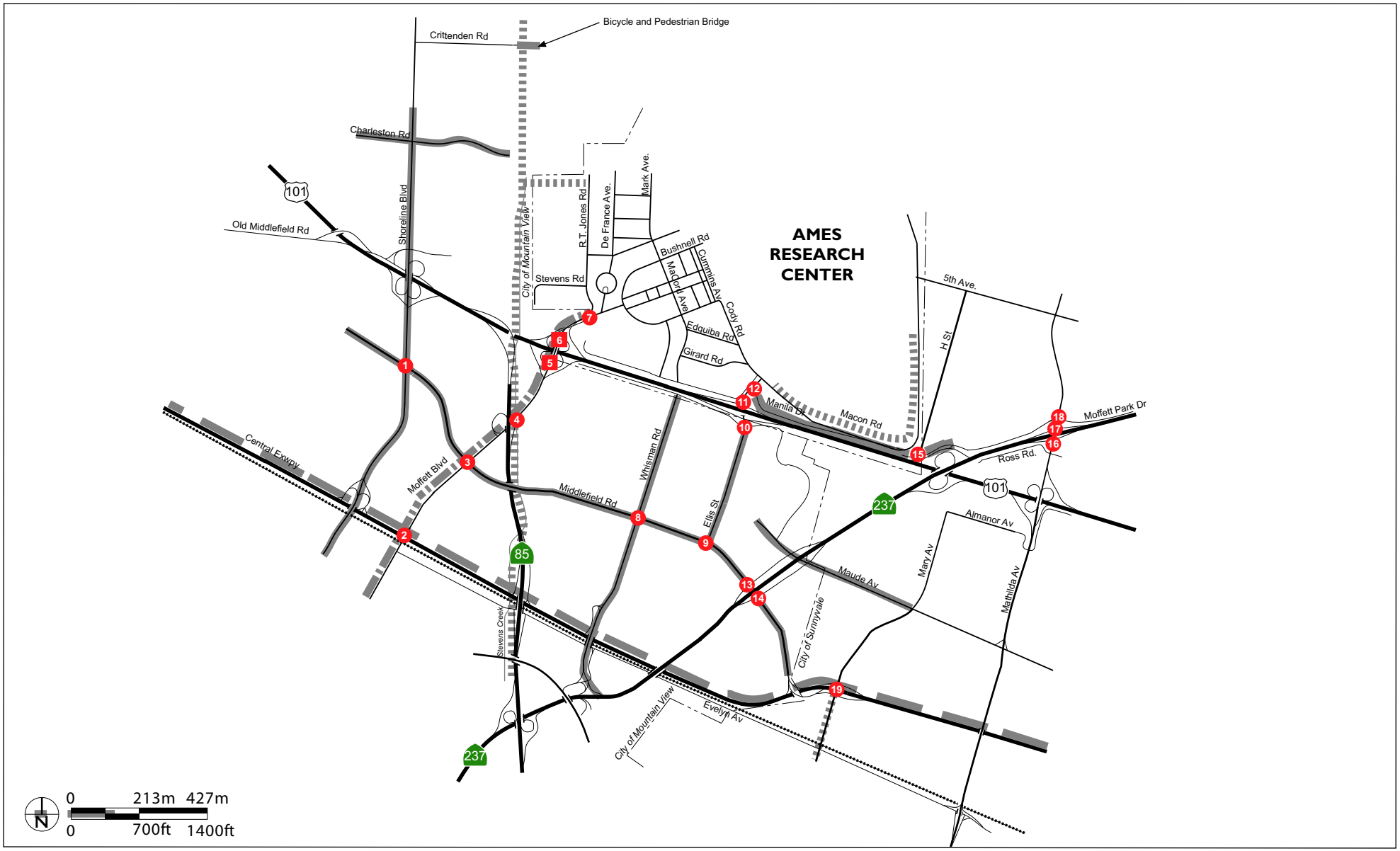
NASA AMES DEVELOPMENT PLAN FINAL EIS

Bike lanes are also marked on Ellis Street on the west side of the Highway 101 interchange. Bicycle travel through the Ellis Street interchange is also considered difficult because cyclists must share the relatively narrow travel lanes with vehicles under the Highway 101 overpass. Designated bike lanes are provided on Manila Drive east of Ellis Street.

Designated bicycle facilities on the eastern side of Ames Research Center are limited. A portion of H Street includes bicycle lanes, but no facilities are provided on either Mathilda Avenue or 5th Avenue. However, Manila Avenue along the southern edge of the airfield and Moffett Park Drive to Mathilda Avenue is a Santa Clara County-designated bicycle route. The high level of congestion through the Highway 237/Mathilda Avenue interchange during peak periods and the overall character of the road as a high-capacity arterial with multiple travel and turn lanes is considered detrimental to bicycle travel. Combined, the available facilities provide for a reasonable level of bicycle access to the Ames Research Center area but the gaps in exclusive bicycle facilities across Highway 101 and Highway 237 limit the attractiveness to cyclists. Existing bicycle facilities within the study area are shown on Figure 3.3-5.

Sidewalks currently exist on many Ames Research Center roadways, including most of those within the Ames Campus area and the Shenandoah Plaza Historic District. In the remaining area of ARC, the provision of pedestrian facilities is less consistent. For example, there are no sidewalks on Cody Road, and sidewalks are missing on parts of Edquiba and Girard Roads. In general, however, sidewalks are provided in those areas with higher pedestrian activity. Pedestrian concerns center around sufficient street lighting and non-standard marking and signing of street crossings.

Outside of Ames Research Center, sidewalks currently exist on Moffett Boulevard, Ellis Street, and Manila Drive. Similar to the existing bicycle facilities, the lack of exclusive pedestrian facilities across Highway 101 severely limits the viability of pedestrian activity as an alternative travel mode.



Source: Fehr & Peers Associates, Inc.

Bike Path
Bike Lane
Bike Route
Bikes Permitted on Expressway Shoulders

FIGURE 3.3-5

EXISTING BICYCLE FACILITES

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4. Transportation Demand Management

NASA has established a number of Transportation Demand Management (TDM) or similar programs for employees that help reduce the number of automobiles trips generated by the existing uses in the Ames Campus and NASA Research Park areas. These programs include:

- **Caltrain and Light Rail Shuttle:** As described earlier, NASA operates a direct shuttle between the Ames Campus area and the Caltrain station in downtown Mountain View. Directional ridership (e.g. number coming into ARC in the morning or leaving in the afternoon) varies between 40 and 60 people per day, depending on the season. NASA also provides shuttle operations to serve the Bayshore LRT station near the Ellis Street/Manila Street intersection.
- **Transit Pass Subsidies:** All civil servants (NASA employees and military personnel) at Ames Research Center are eligible for reduced-cost transit passes ($30 off the monthly pass for any Bay Area transit service). Approximately 100 people participate in this program, with over fifty percent (50%) purchasing Caltrain passes and thirty-five percent (35%) purchasing VTA passes.
- **Preferred Parking for Carpoolers:** To encourage carpooling, NASA provides preferred parking for registered carpool vehicles. At present, over 360 people are enrolled in the program, with 170 vehicle passes issued. The high availability of parking may reduce the number of employees that register for this program. Thus, the program numbers do not reflect the total number of carpoolers at ARC. Participation in this program may be expected to increase under the proposed development plans as NASA employees are concentrated in the Ames Campus area, access to parking in the Historic District is reduced, and the demand for parking within ARC as a whole, increases.
- **Flexible Work Schedules:** Under a NASA-wide policy, employees can work flexible schedules with the approval of their supervisor. Options include starting as early as 6:00 a.m., working a compressed schedule that allows for every second Monday or Friday off, or working four 10-hour

days per week. Detailed information on the impact of this program is not available, however informal inquiries revealed that many employees take advantage of this flexibility to avoid commuting during the worst of the peak hours.

— **Telecommuting:** On a limited, case-by-case basis, employees can make arrangements with their supervisor to telecommute. Because this is done on an individual basis and not as part of a specific program, information on the number of telecommuters is not available.

— **Bicycle Lockers:** Bicycle lockers are provided at several locations throughout the Ames Campus area. These lockers are intended for employees who cycle to work at least three days per week. Currently, 94 people have registered for lockers. In addition, the VTA recently installed six bicycle lockers at the Bayshore LRT station at employees' requests.

— **"Community" Bicycles:** A number of individual branches and divisions with the Ames Campus area have purchased bicycles that may be used by their employees for travel within the campus. This program is not available to all employees, and impacts only internal trip-making.

Overall, the existing TDM programs result in an estimated 21 percent reduction in the number of single-occupant vehicle trips generated by the NASA-controlled portion of Ames Research Center relative to the typical number of single-occupant trips that would otherwise be expected from a similar number of employees in Santa Clara County. Additional opportunities for employees and visitors to use alternative modes of travel will be provided by the extension of the Tasman East VTA light rail line from I-880 in Milpitas to Hostetter Road in San Jose (scheduled for Fall 2004), as well as further expansion of ACE train service between the Central Valley and Santa Clara County, including accommodation of additional bicycles on each train.

5. Parking

Parking is currently accommodated at a number of lots and on-street locations through ARC. An inventory conducted in February and March of 1999 identified over 10,000 parking stalls or spaces within the entire Ames Research

Center complex. Of these, over 6,000 are located within the proposed NASA Research Park area and the remainder are located in the Ames Campus (north of Bushnell Road) and in the Eastside/Airfield area. With the current level of activity in this area, the parking supply greatly exceeds the demand. While the project would greatly increase the level of activity and parking demand, it also includes significant changes in the supply of parking, including the construction of several new parking facilities. However, parking supply in the NRP and Bay View areas would be kept relatively small, and personnel would be required to pay for parking in order to encourage the use of alternative modes.

D. Future Cumulative Conditions

As noted in Chapter 2, this EIS evaluates a future case that will vary from existing conditions in several ways. Under future cumulative conditions, projects already approved as the baseline under the CUP and CANG EA's will have occurred. Cumulative projects foreseen in Mountain View and Sunnyvale, as well as overall traffic growth in other areas, will also have occurred. This section analyzes transportation conditions under future cumulative conditions.

1. Background Traffic Growth

Development projects in other cities and throughout the Bay Area will contribute to traffic growth within the study area. The methodology used for forecasting future background traffic volumes follows that described in *Transportation Impact Analysis Guidelines* published by the VTA as part of the Santa Clara County CMP. Future year traffic forecasts were developed using a combination of the CMP countywide travel demand forecasting model and City of Mountain View and Sunnyvale standards for transportation impact studies.

As with all travel demand forecasting models, this model uses projections or assumptions regarding future year land uses and the transportation network as

inputs to estimate future travel demand. This model was originally developed by the Center for Urban Analysis and is now maintained by the VTA. The model forecasts originally reviewed in this analysis were produced in late 1999 for other projects, and data from forecasts produced in early 2001 also support the conclusions listed below.

Forecasts from the travel demand model were not used directly. Cumulative future year forecasts are typically developed by comparing base year model and horizon or future year model forecasts and applying the resultant ratio to existing traffic volumes. The base year for the VTA model is 1997 and the future year forecasts are for Year 2025. However, a comparison of base year and future year model forecasts showed that the 2025 AM and PM peak hour link volumes were lower than corresponding 1997 model volumes at numerous locations within the study area including on freeway segments. The projected reductions are likely the result of at least two factors: 1) a projected improvement in the jobs-housing balance in the region resulting in shorter trip lengths and less congestion, and 2) substantial changes in overall land uses that will change travel patterns. For those locations where model forecasts did increase, the average increase resulted in an average annual growth rate of one percent.

The City of Mountain View uses a more conservative annual growth factor of two percent for near term studies. Thus, a factor of two percent per year for the first three years (2000 to 2002) plus a factor of one percent per year for the next eleven years (to 2013) was applied to existing intersection volumes. These growth rates were used for all turning movement volumes at street intersections including those projected to decrease by the model. Since most of the freeway segments are already congested, an annual growth factor of 0.5 percent per year was applied to all existing freeway volumes to estimate 2013 traffic volumes.

2. Cumulative Projects

Cumulative projects studied in this EIS includes the baseline projects approved under the CUP and CANG EA's at Ames Research Center, as well as proposed, pending, approved and recently constructed development projects

in the Cities of Mountain View and Sunnyvale. All of this development is described in Chapter 2 of this EIS.

The amount of traffic generated by these projects was estimated based on their corresponding traffic studies or using standard rates published in *Trip Generation* (Sixth Edition, Institute of Transportation Engineers). A summary of trip estimates for the CUP uses are presented in Table 3.3-8, and the list of approved/pending projects is presented in Table 2-8 in Chapter 2. Trip generation from these approved and pending cumulative projects is contained in Appendix B. The total number of trips generated by the baseline uses at NASA were reduced by a total of 4.5 percent per VTA and Mountain View guidelines to account for TDM measures (the proximity of employment to light rail service, a shuttle program, and improved on-site bicycle and pedestrian facilities). No reductions were applied to approved and pending project trips in the adjacent cities.

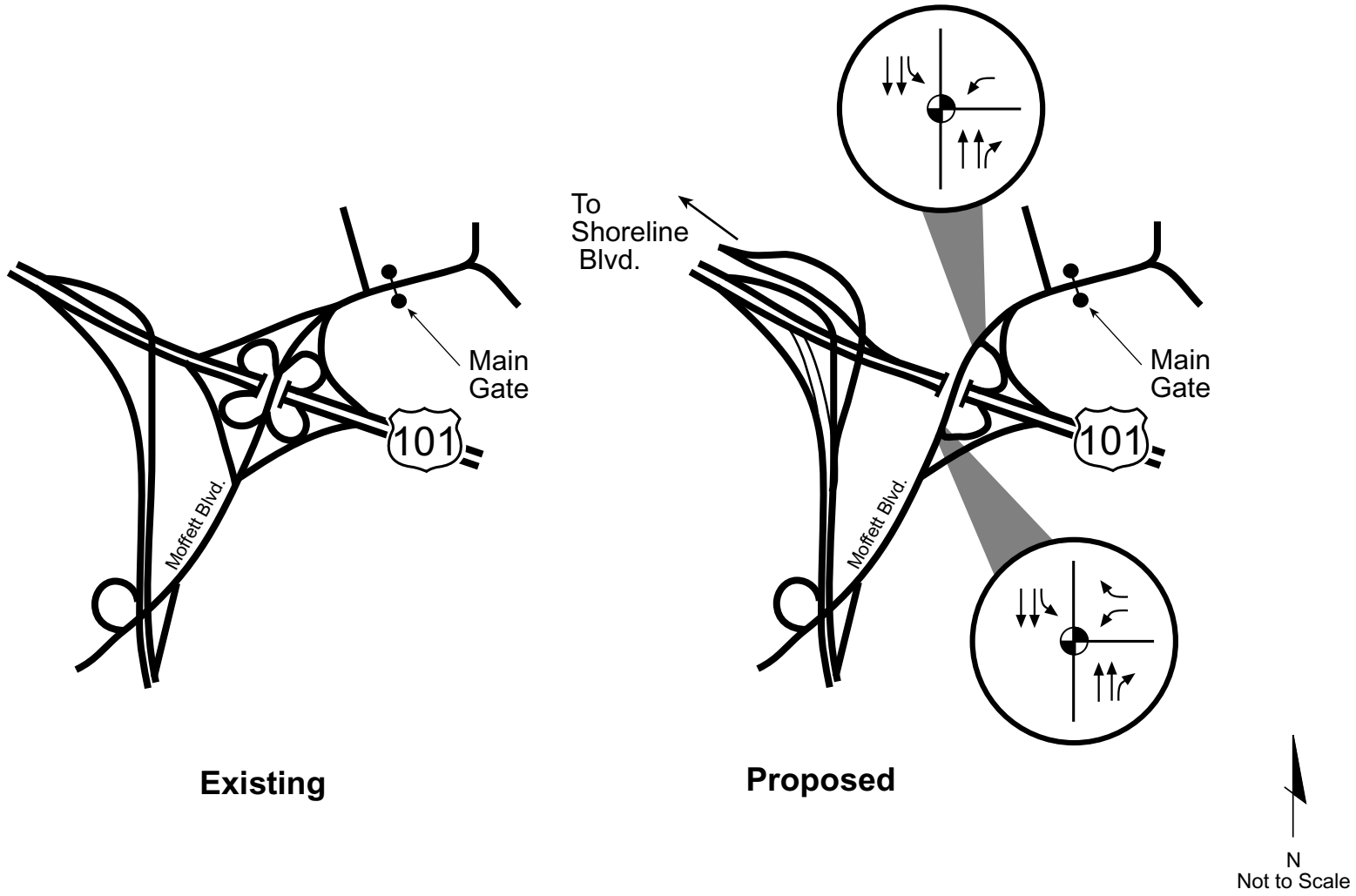
Trips associated with all of the baseline uses were assigned to the roadway network based on the same distribution of project traffic described in the Impacts Discussion section (Section 4.3). Trips from cumulative projects were assigned based on data from the corresponding traffic study or based on the location of growth-factored existing volumes described above. Thus, future cumulative traffic volumes for 2013 include existing traffic, traffic from regional growth, traffic from the approved and pending cumulative projects in Mountain View and Sunnyvale listed in Chapter 2, as well as traffic from already approved baseline projects in the Ames Research Center. In Section 4.3, future cumulative volumes will be used as the base case against which to identify potential project impacts.

TABLE 3.3-8 **TRIP GENERATION SUMMARY – ALTERNATIVE I**

	Trips						
		AM			PM		
	Daily	In	Out	Total	In	Out	Total
NRP Total	5,847	866	75	941	118	794	912
On-site Housing Reduction	0	0	0	0	0	0	0
TDM Trip Reductions (4.5%)	-263	-39	-3	-42	-5	-36	-41
Net NRP Trips	**5,584**	**827**	**72**	**899**	**112**	**759**	**871**
Total Net Trips	**5,584**	**827**	**72**	**899**	**112**	**759**	**871**

3. Planned Transportation Improvements

The most notable improvement proposal for the study area is the re-design of the Highway 101/SR 85 interchange. This project will reduce the number of merge/diverge and weaving situations on the freeway. Doing so is intended to bring this section of freeway up to current Caltrans standards, improve safety, and reduce system breakdowns due to incidents. It is also anticipated that the project will result in overall higher operating level-of-service (LOS) for all facilities in the project area. The proposed improvements include adding auxiliary lanes, collector roads, braided ramps, direct HOV lane connector ramps, and reconfiguring existing interchanges. This includes reconfiguration of the Moffett Boulevard interchange from its existing standard cloverleaf design. The proposed design includes the elimination of selected ramps, reconfiguration of the remaining ramps, and the construction of two new signalized intersections on Moffett Boulevard, as shown in Figure 3.3-6. Construction of this project is expected to begin in 2002 and be complete by 2005. The modified interchange was included in the analysis, and the two new



Source: Fehr & Peers Associates, Inc.

FIGURE 3.3-6

PLANNED MOFFETT/ HIGHWAY 85 INTERCHANGE IMPROVEMENTS

signalized intersections were used in the Future Cumulative and Project Conditions analyses.

No other changes to existing street intersection lane configurations were assumed under Future Cumulative No Project Conditions. Accordingly, the configuration of the Moffett Boulevard/Clark Memorial Drive and Ellis Street/Manila Drive intersections were assumed to remain unchanged (i.e.,unsignalized), even with the addition of traffic from developments previously approved under the CUP.

The cities of Sunnyvale and Mountain View have identified planned transportation improvements in their respective General Plan Land Use and Transportation or Circulation Elements. Major improvements expected to affect the key study intersections are proposed in both documents. In Sunnyvale, for example, the Land Use and Transportation Element foresees the construction of the Mary Avenue overcrossing to H Street over Highway 101 and the construction of an urban interchange at the Central Expressway/Mary Avenue intersection. However, neither sources for full funding of both of these improvements nor a schedule for implementation has been identified. As such, they were not included in the future cumulative analysis. This ultimately results in a more conservative analysis of project intersection impacts.

Although other changes to bicycle, pedestrian, and transit facilities and services will occur during the next five to 15 years, it is not possible to determine the scope of these changes or which planned (but not funded) improvements might be implemented. By not assuming improvements to each alternative mode, the environmental analysis is considered more conservative and better highlights potential project impacts. For informational purposes, several planned and proposed improvements are described below.

The San Francisco Bay Trail is a trail and path system approximately 640 kilometers (400 miles) long that will ultimately encircle the Bay, and will include crossings of all of the toll bridges. At this time, 340 kilometers (210 miles) have been completed, although Ames Research Center forms a gap in the

southern link between Shoreline Park in Mountain View and Moffett Park in Sunnyvale. The Association of Bay Area Governments (ABAG), in cooperation with the South Bay Ad Hoc Committee of the San Francisco Bay Trail coalition, is studying the feasibility of extending the cycling and hiking trail through the Ames Research Center area. According to information on the ABAG website, the current proposed alignment for the Bay Trail is along the north side of Ames Research Center, near the waters of San Francisco Bay. Completion of the trail will vastly improve continuous non-automobile access to the area east of Highway 101. Design elements such as vegetative buffers and fencing will have to be incorporated between the trail in certain areas (e.g., the runways) to maintain a safe public area. To this end, NASA and ABAG have signed a Bay Trail planning Memorandum of Understanding (MOU).

The VTA plans to extend light rail service in east San Jose beyond the extension currently under construction in Milpitas on Tasman Drive and Great Mall Parkway. Service is ultimately planned to extend to Eastridge Mall and State Route 87, where the existing Guadalupe line operates. The Vasona line will provide service between Los Gatos and downtown San Jose. In addition, Santa Clara County voters recently approved a 30-year ½-cent sales tax extension for transit improvements that will fund an extension of Bay Area Rapid Transit (BART) service from its existing terminus in Fremont to San Jose and Santa Clara. This extension is expected to take at least 10 years to design and construct. However, these new transit services will provide travel alternatives and will help to reduce the number of single-occupant vehicle trips in the south Bay Area.

The City of Sunnyvale has plans to construct pedestrian/bicycle bridges on Borregas Avenue over Highway 101 and SR 237 east of the study area. Bike lanes on Moffett Park Drive east of Mathilda Avenue are also planned. These facilities will improve access across these freeways and provide an alternative to the congested Mathilda Avenue corridor for bicyclists.

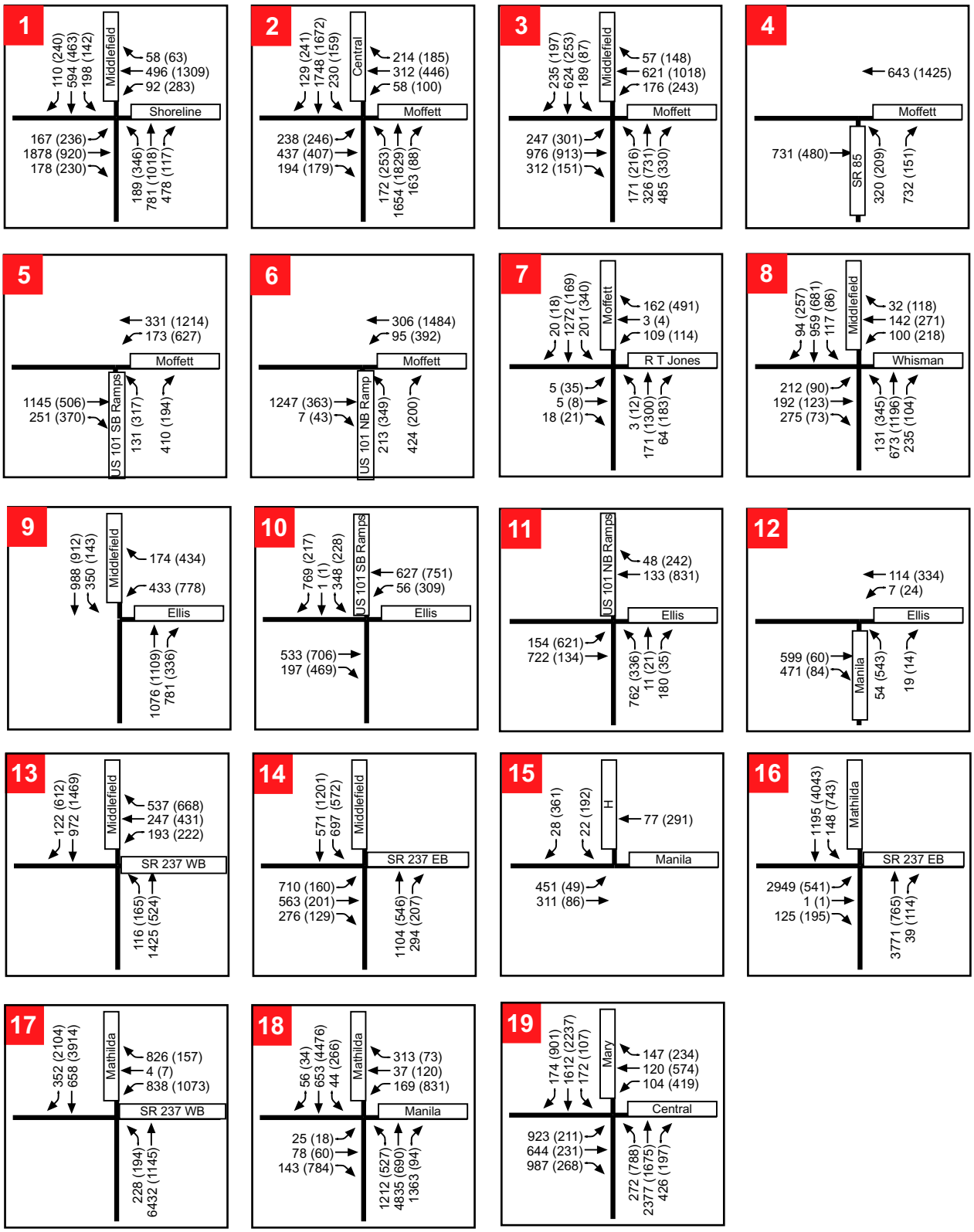
4. Future Cumulative Intersection Operations

Traffic volumes under Future Cumulative Conditions without the Project are illustrated on Figure 3.3-7 and include existing traffic volumes, traffic from regional growth, and approved/pending project development traffic. These volumes and the existing and planned transportation improvements were used to calculate intersection levels of service under 2013 Future Cumulative No Project conditions. The results of this analysis are presented in Table 3.3-9.

This analysis shows that six of the study intersections are projected to operate at unacceptable levels (LOS E or F) based on Mountain View and Sunnyvale operating standards. The LOS results also indicate that there is still some available capacity at the remaining intersections even with the addition of approved and pending projects and regional growth.

5. Future Cumulative Freeway Operations

Freeway segment operations are affected by numerous factors including ramp operations, downstream bottlenecks, incidents (i.e., accidents), etc. Because of these variables and the inability to predict future speeds on the freeway mainline, there is no accurate method available to evaluate impact to operations of adding project-generated traffic on a segment already operating at LOS F under stop-and-go conditions. Accordingly, future cumulative freeway operations without the project in 2013 were not estimated.



not to scale

Source: Fehr & Peers Associates, Inc.

XX (YY) = AM (PM)
Peak Hour
Traffic Volumes

FIGURE 3.3-7

BASELINE 2013 NO PROJECT VOLUMES

TABLE 3.3-9 **2013 FUTURE CUMULATIVE INTERSECTION LEVELS OF SERVICE (WITHOUT THE PROJECT)**

Intersection	Peak Hour	Delay (sec)[a]	LOS[b]
1. Middlefield Road/Shoreline Boulevard	AM	*48.5*	*E*
	PM	*48.5*	*E*
2. Moffett Boulevard/Central Expressway*	AM	48.0	E
	PM	53.4	E
3. Moffett Boulevard/Middlefield Road	AM	36.1	D
	PM	36.1	D
4. Moffett Boulevard/SR 85 NB Ramp	AM	11.3	B
	PM	5.6	B+
5. Moffett Boulevard/US 101 SB Ramps	AM	10.3	B
	PM	12.1	B
6. Moffett Boulevard/US 101 NB Ramps	AM	10.6	B
	PM	11.2	B
7. Moffett Boulevard (Clark Road)/	AM	*63.8*	*F*
R.T. Jones Road	PM	*196.6*	*F*
8. Whisman Road/Middlefield Road	AM	13.6	B-
	PM	15.1	C+
9. Ellis Street/Middlefield Road	AM	21.6	C
	PM	17.2	C
10. Ellis Street/US 101 SB Ramps	AM	21.3	C
	PM	16.8	C+
11. Ellis Street/US 101 NB Ramps	AM	18.2	C
	PM	11.8	B
12. Ellis Street/Manila Road	AM	10.8	B
	PM	20.5	C
13. Middlefield Road/SR 237 WB Ramps	AM	15.3	C+
	PM	19.4	C+
14. Middlefield Road/SR 237 EB Ramps	AM	19.3	C
	PM	12.7	B
15. Manila Road/H Street	AM	7.1	B
	PM	11.0	B
16. Mathilda Avenue/SR 237 EB Ramps	AM	*100.5*	*F*
	PM	17.3	C
17. Mathilda Avenue/SR 237 WB Ramps	AM	*284.6*	*F*
	PM	*>360*	*F*
18. Manila Road (Moffett Park Extension)/	AM	*>360*	*F*
Mathilda Avenue	PM	*339.3*	*F*
19. Central Expressway/Mary Avenue*	AM	*85.6*	*F*
	PM	48.6	E

[a] Whole intersection weighted average stopped delay expressed in seconds per vehicle
[b] LOS calculations for signalized intersections performed using the 1985 *Highway Capacity Manual* methodology contained in the TRAFFIX software package with adjusted saturation flow rates to reflect local conditions.
[C] LOS calculations for unsignalized intersections performed using the 1997 *Highway Capacity Manual* methodology contained in the TRAFFIX software package.
*Denotes CMP intersection with LOS E standard. All other locations use LOS D standard.
Unacceptable levels of operation are shown in *italics*.